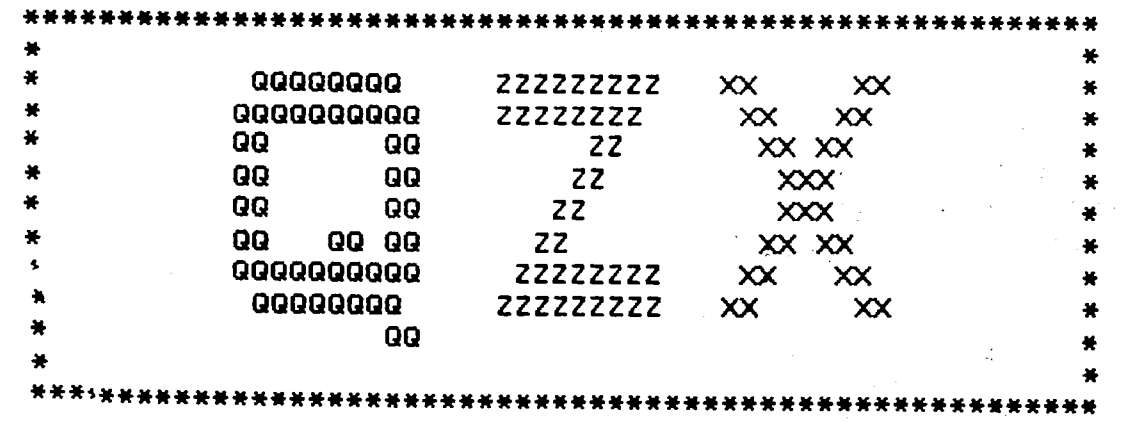

The Journal Covering Amateur Radio & Sinclair Computers
ZX80; Micro-Ace; ZX81; TS1000, 1500, & 2068; QL; Z88
Alex. F. Burr, K5XY, Publisher
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EDITOR'S NOTES

K5XY

Well, the printer did it again. I got yet another price for doing the June issue. (That sentence sure looks familiar.)

I also got all the QZX money back after the savings and loan organization it was in collapsed. After it was closed, it was announced that people could start getting their money back at noon on a Sunday. People started lining up at 6:30 AM. In the afternoon there was a line three hours long. I waited until Tuesday morning. There was no line. It took me less than 10 minutes to sign a paper, show some identification, and pick up a preprinted check for QZX. A very efficient operation. I can imagine the difficulties if there had not been deposit insurance.

Obviously I have returned from Guatemala. I had planned to just give a few lectures about power supplies there, but fifteen minutes after the course started I was told that I was in charge of everything. Thus I was kept pretty busy, particularly the first night when I had to produce an outline for the whole three weeks. I did not get to sleep until 5AM.

I did not get to investigate the computer situation very completely either. In Guatemala City there was a large computer store which at one time sold Sinclair computers. Now it concentrates on Commodore. I saw a store selling Epson computers (and printers). I saw a new school which was teaching the operation of IBM PC's, and the lab I was at had two IBM clones, one a 386 machine. I had hoped to find some of the Sinclair clones which at one time were made in Mexico, but no such luck.

Sinclair computers still get an occasional mention in the mainstream computer magazines here. In the last issue of Byte the columnist, Jerry Pournelle, mentioned how much he likes and uses the Z88 on his many trips.

One day after this issue is mailed, I leave for El Salvadore. There I will be setting up an instrument repair facility, which I hope will have access to at least one PC. I will see if I can find any traces of Sinclair there. I will be gone for a month, so the next issue of QZX will be delayed a bit because I will have to print it after I come back; but it will be out in August.

UNCLASSIFIED ADS

WANTED: UNCLASSIFIED ADS for publication in QZX. Cost is 1 cent for each keystroke (characters, blanks, etc.). Payment must be included with order. This is an excellent way to sell your program or unwanted equipment, ask for help, or find a specific program. Send your ad with payment to QZX, 2025 O'Donnell, Las Cruces, NM 88001.

WANTED: Schematic wiring diagram for "Banana Gorrilla" printer. Edward L. Radtke, 1602 Woodluck Ave., Louisville, Kentucky 40205, 502-458-7324.

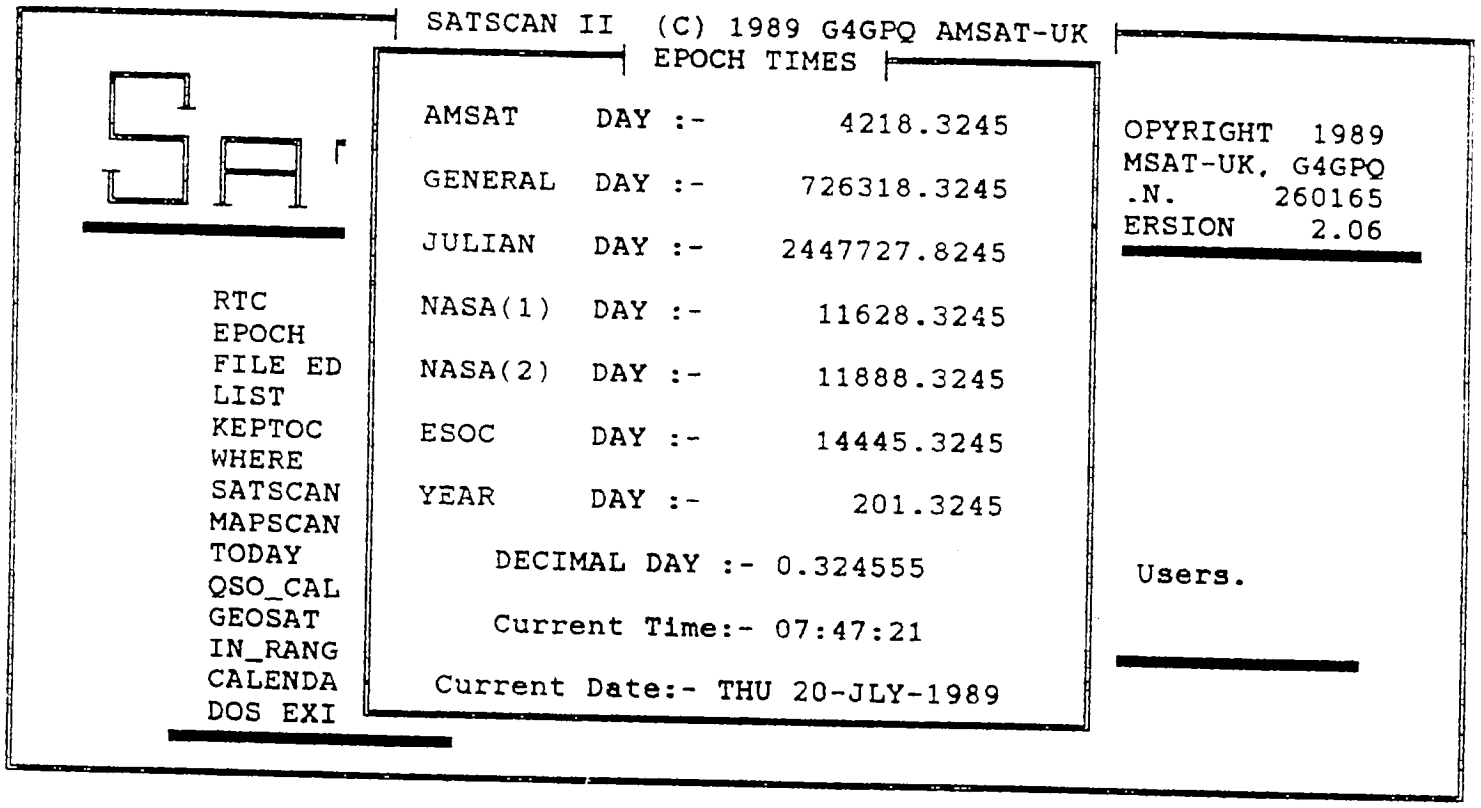
QZX FRIENDS

W4EDL -- Bob renewed and sent a generous contribution to the postage fund. He also sent a small program with application to UHF. He may expand on it a bit if I can pursuade him that there is some interest in it.

WA6DLI -- Bob was given a nice write up in the last issue of LIST, the newsletter of the Long Island Sinclair Timex Group. He managed to get in a plug for QZX. He also said he likes the QL so much that he has bought a few spare ones for the future.

WA6OUC -- Warren, an original QZX subscriber, finally got me to recognize that he had renewed a long time ago. I sent him a big package of overdue issues.

SCREEN FROM A BRITISH SATELLITE PROGRAM FOR THE SPECTRUM SHOWING SOME OF THE MANY WAYS A PARTICULAR DAY CAN BE DESIGNATED



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EXPLORING THE TS1000 SINCLAIR LOGIC CHIP (SCL) IX

Don Lamen

This article is a continuation of the series which began in the October 1989 issue of QZX. The purpose is to explain the function of the SCL logic chip in the ZX and TS1000 series of Sinclair computers. This chip is a custom chip designed particularly for our computers. The previous articles gave some background on the chip, provided a functional diagram, and listed 17 separate functions performed by the chip. These and succeeding articles discuss these functions individually and provide an equivalent circuit diagram for the function. These circuit diagrams are only the equivalent of the actual circuits inside the chip because nothing is known about the real connections inside, but the circuits given here will perform the function of the real circuit. For a list of these 17 functions see the October issue of QZX.

Last month we looked at the last of the circuits when the video, tape and select circuits were discussed. This month concludes the series with a discussion of some of the parameters used by the SCL and a few notes on the timing of some of the signals. For a discussion of the timing signals and a timing diagram, see the December (1989) issue of QZX.

Parameters

Dot clock frequency:	6.5 MHz ± 200 Hz
Processor clock frequency:	3.25 ± 100 Hz
Dot period (Td):	0.3076923 uS ± 4.7 pS
Horizontal sync pulse:	19 Tp = 5.85 µS
Horizontal scan line:	207 Tp = 63.69 µS
Frame sync pulse:	1212 Tp = 372.92 µS
One frame:	54234 Tp = 16687.384 µS

1/60 S = 16666.7 µS

Therefore the frame time is 0.12% slow, well within the allowable 2%.

Normal horizontal TV scan = 63.4 µS

Therefore the horizontal scan time of the computer (63.69 µS) is 0.46% slow, also well within the allowable 2%.

NOTE: After the first frame, each frame equals exactly 262 scan lines.

Interrupt Timing Notes

NMI

1. If NOT NMI is low and NOT HALT is low, the instruction execution time is 11 Tp (the same as a normal RST instruction).

2. If NOT NMI is low and NOT HALT is high, the wait circuit built around transistor TR-1 pulls the NOT WAIT pin of the Z-80 low. The M1 cycle of the NMI instruction does not poll the NOT WAIT pin. Therefore the NOT WAIT signal is not detected until T2 of M2, a WRITE cycle, which is the 7th T cycle of the instruction. This leaves 5 T cycles to be completer after the NOT NMI pin goes high. Therefore, the execution time of this instruction is equal to the horizontal sync + 5 Tp (24 Tp).

INT

1. In interrupt mode 0 the execution time is 2 Tp more than the normal execution time for the instruction being entered by the peripheral. This is because there are two built in wait states in this interrupt.

2. In interrupt mode 1 the execution time is 13 Tp, two more than a normal RST instruction because of the two built in wait states.

3. In interrupt node 2 the execution time is 19 Tp.

4. The maskable interrupt polls the NOT WAIT line on the 2nd built in WAIT T cycle of M1. If the NOT WAIT line is pulled low late, it can also be detected during T2 of either M2 or M3.

Note

1. Both NMI and INT have a T1, T2, T3, T4, and T5 in M1 and T1, T2, and T3 in both M2 and M3.

2. In INT the built in wait states are between T2 and T3 of M1.

Remember that this entire article is speculation based on careful study of the ROM routines. It is believed that the speculations are very close to the actual architecture of the chip and can be used for practical purposes.

Many references were used while studying this problem. Toni Baker's book Mastering Machine Code on Your zx 81 was a big help in disassembling the ROM code and printing it out.

The book The Complete Timex TS100/Sinclair ZX81 ROM Disassembly by Dr. Ian Logan and Dr. Frank O'Hara was a big help in understanding what was printed out.

The TTL Data Book by National Semiconductor made it possible to select the standard IC's used in the drawings of the circuits.

Zilog's Technical Manual on the Z-80 microprocessor was very helpful while trying to understand the timing.

Time Designs Magazine helped to clarify some of the points pertaining to the I/O section and the frame sync timing.

TS1000 CONTROLS 30,000 VOLTS

LU8MAD

The government power company in the province of Mendoza, Argentina (EMSE) had a big problem. They had to develope a remote and automatic system for the management of power transformer stations in remote areas outside urban sites in places which were difficult to access.

The system which was developed is based on TS1000 boards with software on EPROM's and with the remote stations linked to the head office by VHF radio.

The TS1000 in the main office reads the telemetry sent via the VHF link from the remote 33 kV and 13.2 kV stations and sends back the proper instructions to each remote station.

Today the EMSE company has several of these systems operating. Incidentally one of these TS1000 systems manages the transformer station for a whole oil field.

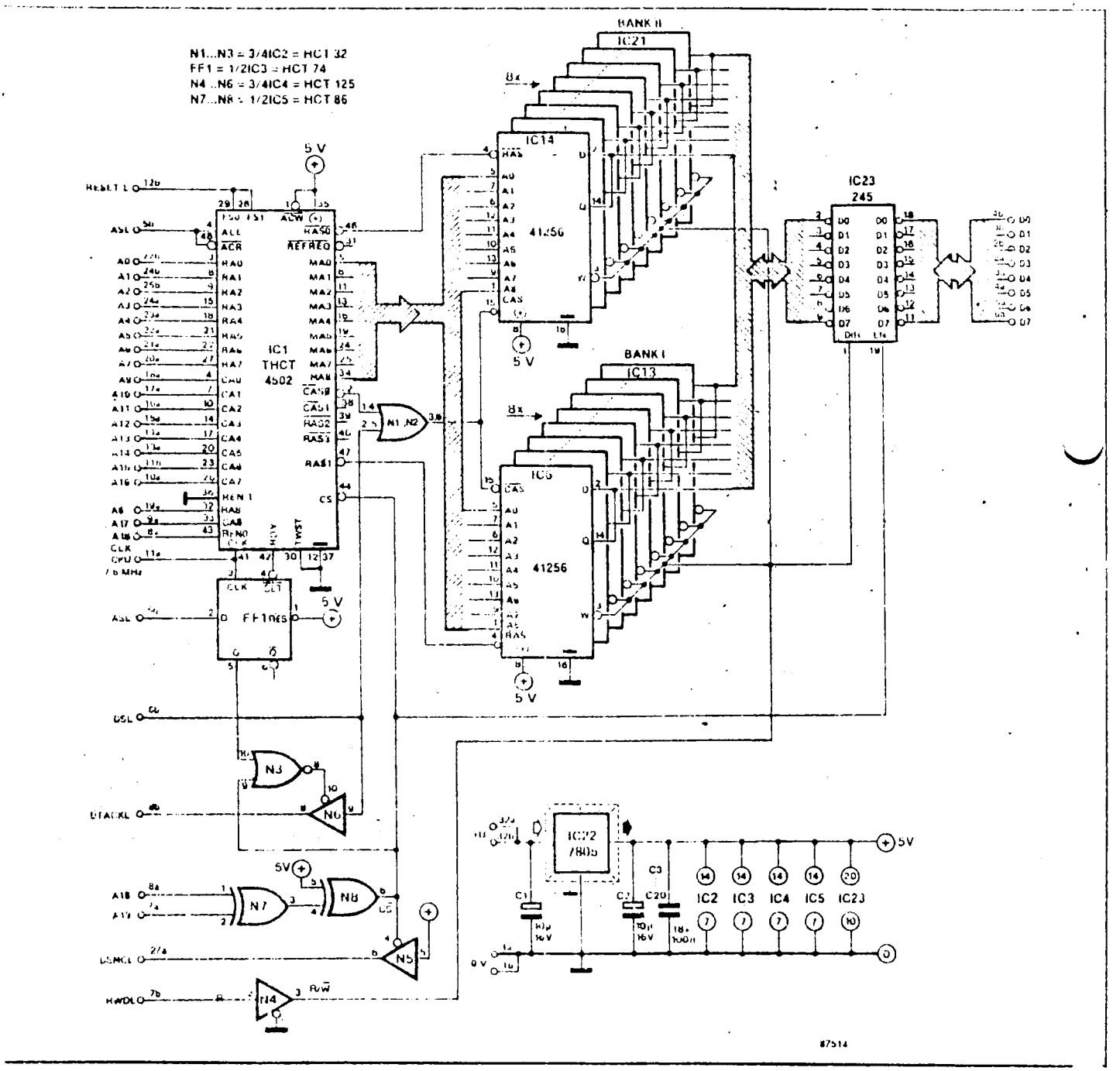
Some days ago I had a conversation with my friend LU3MAM (a ZX Spectrum user), who is a member of the EMSE technical staff. He promised to send me in the future a more complete description of this system which can be published in QZX. It does seem like a useful system which combines the best features of our Sinclair computers with VHF radio.

Remember that an engineering task is to find the minimum means that will solve the problem. The solution described here shows that you should not undervalue the little TS1000 for a big task in the real world.

RAM EXTENTION FOR THE QL (512 K)

LUBMAD

Here is a circuit diagram which can be used as the basis for a 512 K RAM expansion for the QL. There is no printed circuit board pattern but it can be wired up rather easily on a wirewrap board.



The following page is reprinted from the May 1990 issue of the newsletter for the Seattle Area Timex/Sinclair Users Group, SWYM. It contains some suggestions for those who may be trying to connect a regular printer to the TS2068.

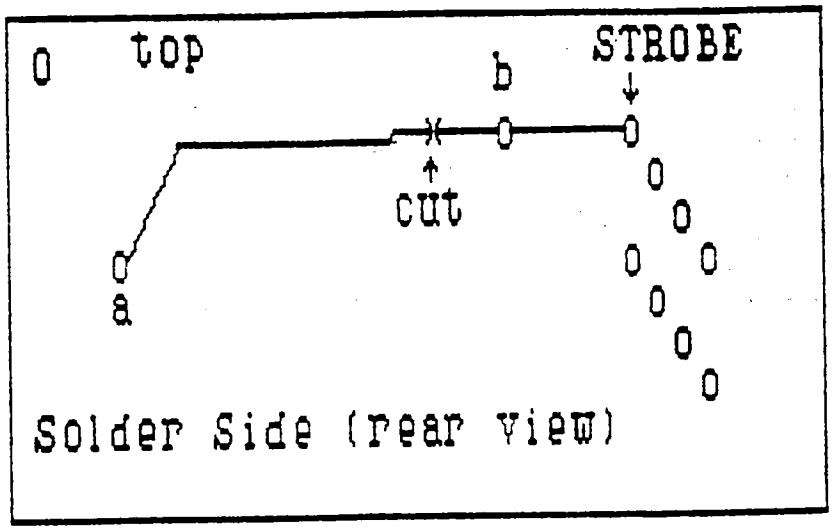
2068 FIX
STAR NX-1000/AERCO CENTRONICS I/F FIX

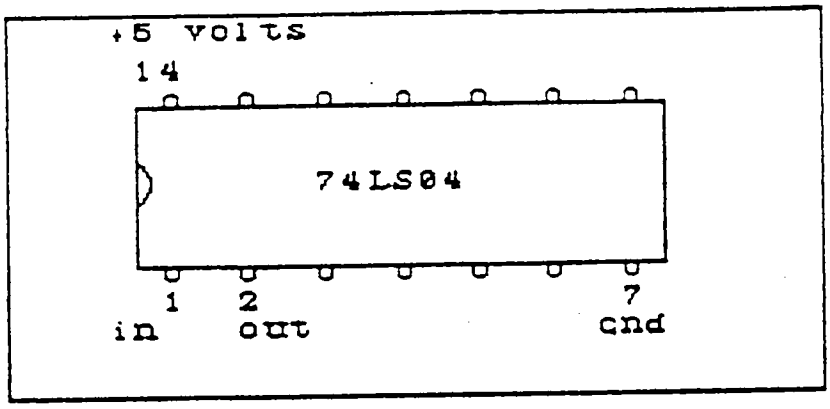
by Richard Hurd

I purchased a new Star NX-1000 Multi-Font printer about a month ago only to find that it would not work with the AERCO Centronics printer interface and the 2068.

I started writing requests for help to everyone I could think of and today I received word back from John Olliger with a suggestion for a fix. Invert the STROBE line. It worked!

First I cut the trace on the AERCO board. I had a 74LS04 IC in the spares box and soldered wire-wrap wire to pins 1, 2, 7, and 14 then to the connections shown. Pin 1 of the 74LS04 to point a of the AERCO I/f and pin 2 goes to point b of the AERCO I/f. Just track down a ground pad and a plus 5 volt pad for power. I used a small piece of double sided sticky tape to hold the IC in place.





73, K5XY

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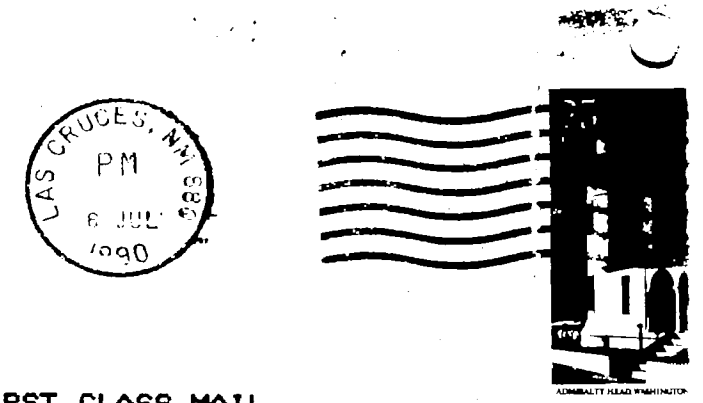

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